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THE MENTOR

GLASS AND GLASS-
MAKING

By ESTHER SINGLETON
Author

DEPARTMENT OF
ART AND SCIENCE

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Skill, Beauty and Use



EVERY good piece of art involves first the evidence of human skill, and the formation of an actually beautiful thing by it, and beyond these the formative arts have always one or other of two objects—truth or serviceableness. The entire vitality of art depends upon its being either full of truth or full of use. The moment we make anything useful thoroughly, it is a law of nature that we shall be pleased with ourselves, and the thing we have made; and become desirous, therefore, to adorn or complete it, in some dainty way, with a finer art, expressive of our pleasure.

Now look at the working out of this broad principle in detail; observe how, from highest to lowest, health of art has first depended on reference to industrial use. There is first the need of cup and platter. And, to hold your cup conveniently, you must put a handle to it; and to fill it, you must have a pitcher of some sort; and to carry the pitcher you may, most advisably, have handles. Modify the forms of these needful possessions according to the various requirements of drinking, of pouring easily out, or of keeping for years the perfume in; of storing in cellars, or bearing from fountains, or sacrificial libation; of treasure of oil, and sepulchral treasure of ashes—and you have a resultant series of beautiful form and decoration from the rude urn up to Cellini's vessels of gems and crystal, in which series are developed the most beautiful lines and most perfect types of composition yet attained by art. The architectural arts begin with the shaping of the cup and the platter, and they end in a glorified roof.

Condensed extract from John Ruskin's "Lectures on Art."

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GLASS AND GLASS-MAKING

By ESTHER SINGLETON



VENETIAN GLASS
17th-18th Centuries

MENTOR GRAVURES

THE PORTLAND VASE

THE LUCK OF EDEN HALL

VENETIAN GLASS

Sixteenth and Seventeenth Centuries

GOBLETS OF BOHEMIAN GLASS

ENGLISH CUT GLASS BOWL

Eighteenth Century

LANDSCAPE WINDOW

Tiffany Favrite Glass



VENETIAN GLASS
17th-18th Centuries



GLASS manufacture is a subject that has many phases, including stained glass, plate glass, optical glass, bottle-glass, wire glass. Some of the most important of these will be covered in future issues of *The Mentor*. This first number of the series discusses Decorative Glass and its manufacture. It is a remarkable fact that, while the chief quality of glass is transparency, all the materials that compose it are opaque. The mysterious agent that produces the change is fire. Glass is the offspring of fire.

Does it not seem strange that so many objects can be made from a steaming liquid metal soup blown through a tube to form a bubble? It is believed that men learned how to manipulate this hot, liquid bubble at an early period of the world's history.

Composition of Glass

Since the beginning, the two essential elements required by glass-makers have been silica and an alkali. Glass falls naturally into two divisions: glass of maritime countries, where the alkali is *soda*; and glass of forest countries, where the alkali is *potash*.

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At all times silica has been derived from solid quartz, either in the form of rock-crystal, or of white pebbles from the beds of rivers, and more frequently from sand obtained from the seashore, or by excavation.

Soda was obtained by the Mediterranean people from the ashes of certain plants growing in salt marshes, or from seaweed. Inland people got their alkali by dissolving with lye the ashes of various trees and plants. In Germany and Bohemia this potash was obtained from beechwood; in France, from the bracken fern. The quality of the glass depended upon the preparation of this soda, or potash.

In all cases there is need of a second base; and this, generally speaking, is lime, or oxide of lead. The soda family embraces the beautiful glass of the Romans and of Mediterranean countries; the enameled ware of the Saracens; and all the artistic productions of the Renaissance, including the Venetian, or Murano, glass. The potash family includes the German, Bohemian and French "forest glass." English flint glass, in which oxide of lead was used with the potash instead of lime, also belongs to the potash group.



GLASS EGYPTIAN BEADS
Twelfth dynasty—about 2,000 years
before Christ

Egyptian Glass

Egypt was famous for its glass. Ruins of glass-works of the highest antiquity have been found near the Lakes of Nitre in the desert, where the priests of Ptah produced imitations of jewels brought from India, besides making every kind of glass article. Museums are full of bottles, ewers, *scarabei* (sacred beetles), mystic eyes, beads and fragments that show how ancient was the art and how varied the uses of glass. Beads and the little bottles or vases in which the fair women of Egypt kept



EGYPTIAN GLASS VASES
18th-20th dynasties

their cosmetics, unguents, scents, and *kohl* for darkening their eyes, are the most characteristic products of the best period of Egyptian glass-making.

Regarding color, the Egyptians preferred blue. The scale ran from blue-black to the palest turquoise; but the favorite was the "Nile blue." Next to blue, came yellow: mustard and pale buff were the best-loved tints. Yellow

GLASS AND GLASS-MAKING



A HIGHLY IRIDESCENT
PHOENICIAN (TYRIAN)
GLASS BOTTLE

was also used to make the curved chevrons and zigzags that decorated a vase or phial.

The pale tint of green felspar was much liked, too. The red imitated jasper. Many strange beads have been discovered; one that belonged to Queen Hatasu of the fifteenth dynasty (1450 B. C.) says in hieroglyphs that she was "beloved of the Goddess Hathor."

Phoenician and Cypriote Glass

The Phoenicians followed Egyptian ideas. They were celebrated for a pure white glass. Phoenicia was also famous for its beads,—those "aggry" beads, which have been dug up in all countries—Europe, Asia, India and parts of Africa—wherever the Phoenicians traded. These beads are opaque and of great variety. Some were used for barter, others were made to please fastidious customers.

Artistic glass does not seem to have developed in countries where pottery was brought to perfection. In Greece, for example, glass was almost neglected. The earliest Greek writer to speak of it is Aristophanes (lived about 450–380 B. C.), who talks of "cups of gold and of glass." Homer does not mention glass.

Most Greek glass has been dug up in the Greco-Phoenician tombs in the islands of Cyprus and Rhodes, where the Phoenician and Egyptian influences were strong. The glass objects found in Rhodes and Cyprus, dating from about 800 B. C., are chiefly little bottles, rounded or pointed at the base, that resemble the *kohl* and unguent bottles of the Egyptians. Although there are a few specimens of light green, pale rose, blue with spiral lines and pale buff, and some examples decorated with zigzag, wavy lines incorporated in the glass itself, most of the bottles were of colorless glass, now exquisitely iridescent from age.

Roman Glass

The Romans derived their art from Phoenicia and Egypt. Glass-houses of Sidon and Alexandria supplied the Eternal City long before the days of the luxurious emperors. Factories were in operation in 54 B. C. under Augustus;



GLASS MADE IN THE FIRST CENTURY, A. D.

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and it was not long before Rome carried the art to a point that had never before been reached.

The great number of specimens and fragments dug up in all parts of Europe seem to prove the theory that glass was even more used in the ancient than in the modern world. There is no process used in present times that was unknown to the Romans two thousand years ago. They used glass for every conceivable purpose, even for such small articles as dice, and balls to cool their heated hands. They made glass in every color but ruby, and they made opaque, mottled and variegated glass. They decorated glass with painting, enameling, gilt inlay and engraving; and they cut it to resemble cameos.

They also made milky white and opalescent glass, a mosaic formed of myriad patterns (later imitated by the Venetians as *millefiori*), and every kind of filigree, and lace-like glass; and they imprisoned spiral threads of different colors in the stems of glasses for decoration in a style that was made hundreds of years later on the island of Murano.

Nothing illustrates Roman skill better than the story of the Emperor Heliogabalus (205-222 A.D.), who, wishing to play a joke on some guests, invited them to a feast. When they took their places at the immense table, set out with the most elaborate viands, confections and fruits (history tells us how luxurious Roman cookery was), they found that all these delicacies were imitations made of glass!

Perhaps the most typical Roman work is the cameo glass. Of this nature is the Portland Vase, from the supposed tomb of the Emperor Alexander Severus (who died about A. D. 235), and a similar urn (Naples Museum), which was found in Pompeii, carefully preserved for future ages by the irruption of Vesuvius in A. D. 79.



ROMAN GLASS
Period of Augustus
(63 B.C.-14 A.D.)



SARACENIC GLASS

Mosque lamp of the early part of the 14th century. In the Metropolitan Museum of Art, New York

Byzantine Glass

When the barbarians advanced upon Rome, Constantine transferred the seat of Empire to Byzantium (Constantinople) in A. D. 330. Among the artisans that were taken to the new city, glass-makers were not the least important. In the Byzantine style are the famous "Hedwig Glasses" (only seven are known), named from the one in Breslau associated with St. Hedwig, patroness of Silesia and Poland. They are thick, heavy tumblers, dark in color, and deeply cut on a wheel, the figures in high relief.

To Byzantium is ascribed the fashioning

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of the cup of the Holy Grail, preserved in the Genoa Museum, and said to be the vessel in which Joseph of Arimathea received the blood of Christ. Guglielmo Embriaco got it when Caesarea was sacked in 1101, and brought it home to Genoa. It was long thought to be made of an emerald; but when Napoleon carried it to Paris in 1806, an expert decided that it was glass. The Holy Grail is an hexagonal dish with feet and handles and slight ornaments finished with a tool. It was broken in Paris. When mended, the pieces were joined by a border of gold filigree.

French Glass

Glass is an ancient industry in France. In the Middle Ages every province had its glass-houses. The art-loving King René of Provence early welcomed Venetian artists in France. Henri II brought Italians to Paris to improve glass-making, and Henri IV established works at Rouen, Paris, and elsewhere. Crystal glass, gilt and enameled glass, and every other Venetian style were imitated.



A BYZANTINE "HEDWIG GLASS"

France, however, was more occupied with magnificent painted glass for her cathedral windows and, subsequently, with "plate-glass" for mirrors and superb glass coaches like that of Cinderella fame.

France produced fine work, although it was overshadowed by the greater productions of Murano. Perhaps the most interesting type is the enameled glass made in the fifteenth century after the Venetian style, with portrait heads, symbolical figures and mottoes, either gallant or religious. This ware continued in vogue in France long after the fashion had passed in Italy.

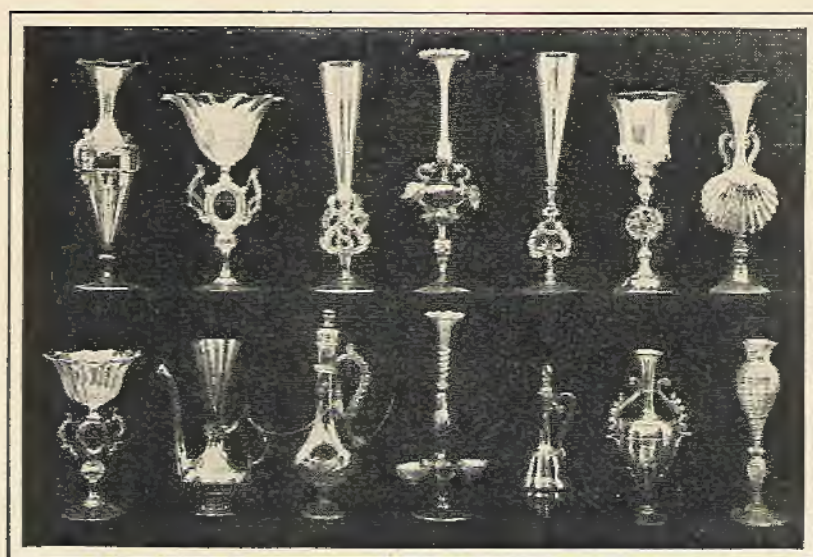
Enameled Glass of the Saracens

The enameled glass made by the Saracens during the thirteenth, fourteenth and fifteenth centuries has only had appreciation as a family, or class, for about thirty years; for it had been submerged under the name "Venetian." The art came from Persia and was developed in Damascus and Aleppo, where Persian craftsmen lived in great numbers. The ware may be compared to rich brocade of a dull gold gleaming with red, green, white and blue enamel, the latter made of powdered



VENETIAN GLASS OF THE SIXTEENTH CENTURY

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VENETIAN GLASS
16th century

lapis lazuli (lazurite stone, also called blue spar).

Crusaders often brought home specimens, taking care to fill them with earth from the Holy Land, which kept them from breaking and, besides, made them more precious. The famous "Luck of Eden Hall" is one of these.

The industry suddenly ceased when Tamerlane captured Damascus (about 1370) and took the glass-makers to Samarkand. In

after years travelers spoke of the gorgeous glass they saw there. This ware continued to be made in a few places; but it was finally surpassed by the vogue of the new Venetian "*cristallo*."

Venetian Glass

Venice had glass-making under artistic control at a very early period. An old writer, Carlo Marin, said that "Venice loved the art of glass-making as the apple of her eye." And he was right. Venice not only took pride in this industry, but it was one important source of her vast wealth.

The Venetians ceased to make enameled glass after the Arabian style at the beginning of the sixteenth century; for they had learned to make an absolutely colorless and transparent glass, capable of being blown to the thinness of a wafer and of being worked into every variety of form. Everybody wanted specimens of the thin, airy "metal," blown into lovely shapes and fantastically decorated with flowers, sea-horses and dragons with spreading wings, or exhibiting spiral lines of milk-white, or colored threads.

The artistic beauty of Venetian glass, made in Murano (an island near Venice), depends entirely on the skill of the glass-blower rather than on that of the enameler, engraver, or cutter. The Murano workmen sought perfection of form, delicacy of color and the fairy lightness of the soap-bubble.

This exquisite glass was imitated everywhere, until it was pushed aside by Bohemian glass. Murano glass-making was revived in 1856 by Dr. Antonio Salviati, a prominent lawyer of Venice, who gave his time and fortune to the restoration of an art that was not dead, but sleeping.



A DUTCH SEA-GREEN
GOBLET

Decorated by Anna Visscher.
In the Ryks Museum,
Amsterdam

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Bohemian Glass

Bohemian glass is a "forest glass" that dates from the sixteenth century, when the Emperor Rudolph II brought Italian engravers of rock-crystal to take charge of the glass-works he had established in Prague to imitate rock-crystal. Up to about 1590 the Bohemians had copied Venetian models, which they decorated with colored enamels. After they began to cut glass, they needed heavier and thicker forms. The first Bohemian glass was white, was cut in facets and engraved with pictures, coats-of-arms and emblems. At a later period colored glass was made.

The famous "ruby glass" was brought to perfection by Johann Kunckel, a Silesian chemist, employed at the Brandenburg glass-works at Pots-

dam. It was said that Kunckel obtained his fine ruby by the use of gold. The shapes of his pieces—ewers, beakers and large covered cups—are simple. He also made a glass of deep emerald tint.

By 1730, Bohemian glass had completely supplanted Murano. It enjoyed enormous popularity for about fifty years, until it was, in its turn, driven out of fashion by the English flint glass.

German Glass

While the Venetians were perfecting their "*cristallo*," the Germans of the Rhine district were developing their ancient "green glass." Rhenish glass varies from greenish blue to pale bottle green, and from dark violet blue to olive green. It is never decorated, nor engraved. "Prunts" are its characteristic ornaments. These knobby projections on the stem are shaped like thorns, mulberries, or grapes.

VENETIAN GLASS VASE
In the Metropolitan Museum

The typical production is the *roemer*. This has a tulip-shaped bowl, a hollow cylindrical stem studded with mulberry "prunts," and a hollow, conical foot formed by coiling a rope of glass around a core of wood. The metal is thick and heavy and full of bubbles and defects. The great cylindrical glasses, sometimes twenty inches high, ornamented with paintings, are called salutation glasses. The tall funnel-shaped glasses and the "cabbage-stalk" glasses are all classed under the name "brimmers."

Glass in the Low Countries

The museums of Holland and Belgium contain enormous collections of splendid native work. Huge glasses, with bowls shaped like tulips and



FRENCH ENAMELED GOBLET
Henry II period (1333-1379)

This was called a marriage cup. The lady has a heart in her hand. On the opposite side is a gentleman in the costume of Henry II's reign, offering a flower to the lady

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FRENCH AND ITALIAN GLASS OF THE SEVENTEENTH CENTURY

funnels, and immense covered cups and cups mounted in gold—the pride of guilds and corporations—appear in the pictures of Rembrandt, Frans Hals, Jan Steen, Terburg, and others.

After the taste for Venetian glass had passed, the Dutch and Flemish took up engraving on glass. The Dutch became adepts. Very famous were three sisters,

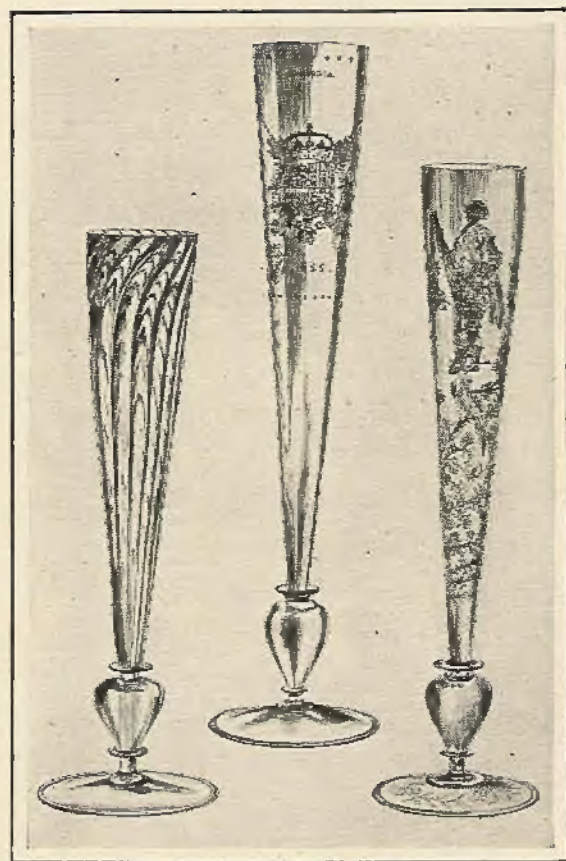
Anna, Gertrude, and Maria Visscher, of Amsterdam. They were well placed in life and excelled in all the accomplishments of their day, “including dancing and engraving exquisitely with the diamond.”

The example here given from the Ryks Museum, Amsterdam, is a pale sea-green goblet decorated by Anna Visscher, with a wild rose, a marigold, a carnation, a dragon fly, an inscription, her name and the date, 1621.

In the late eighteenth century the Dutch excelled in a kind of dotted work (like stipple engraving) that produced the effect of a breath on a pane. They also copied intricate engravings on their dishes, bowls and goblets. Museums also show with pride all kinds of “trick glasses” that suited the heavy merriment of such people as we see depicted by Frans Hals, Rembrandt, Rubens, Van der Helst and Teniers. The Flemings and Dutch were also affected by Bohemian and English influences in the eighteenth century.

English Glass

English glass took a new turn in the days of William and Mary. The English had just invented flint glass, or “lead glass,” which was beautifully clear and hard, with the most wonderful dispersive power of any glass known. This quality was soon seized upon by the cutters, who enriched the surface by many patterns, not only interesting in themselves, but well adapted to scattering the rays of light that passed through the glass and breaking them into prismatic colors. Perhaps the cutters may have begun by



OLD ENGLISH ALE GLASSES

GLASS AND GLASS-MAKING

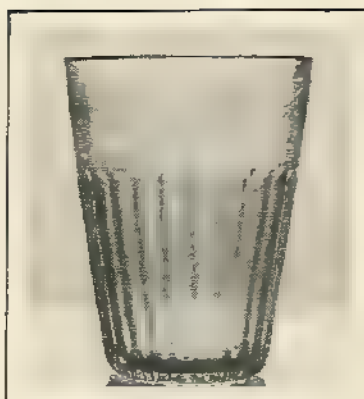
imitating the "quilted china" of the day*; perhaps they were inspired by the lovely metal itself. At any rate, the English "cut glass" that reached its height in 1780 was a beautiful production. And how our Colonial ancestors loved it! Everything in the way of table service was cut into arabesque, flower, star, fleur-de-lis, diamond, hob-nail, fan and strawberry patterns, besides fluting and all sorts of vertical and horizontal lines, both shallow and deep. This lovely glass is not only characterized by its sheen and velvety surface, but it has a deep, bell-like, and lasting musical ring when it is lightly struck.

Colonial American Glass

Glass-makers were brought to Jamestown with the ill-fated settlers of 1607. In 1621 better luck attended the colony and a glass-house was erected to make simple articles and beads for the Indians. Glass-houses sprang up everywhere: there was one at Salem in 1638; one in New Amsterdam in 1654; and one in Philadelphia in 1683. These glass-houses made simple articles, chiefly bottles.

Caspar Wistar of Salem County, New Jersey, started the first real works at Wistarberg. He soon had a rival in the works established by Henry William Stiegel, called "Baron Stiegel," at Mannheim, Lancaster County, Pennsylvania, in 1766. Here the first flint glass was made in America.

Though both Wistar and Stiegel made articles that are highly valued by collectors today, their wares were for simple homes. The wealthy preferred to import their rich glass, or "crystal," as they preferred to call it, from the Old Country. It sparkled from the sideboards and glistened on the polished mahogany supper-tables of our ancestors—particularly in Maryland and Virginia. And to the scintillating dance of light on the dishes and bowls, wine-glasses and decanters, beauty was often added by a candelabrum of several branches rising out of a cascade of dangling prisms that tinkled softly with the lightest breeze, and flashed their rainbow-fire from the center of the table. To many Americans "cut glass" and "old mahogany" suggest pictures of Colonial days



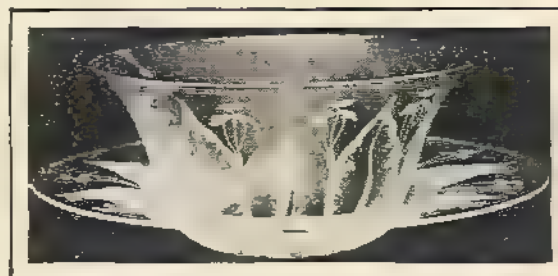
AMERICAN GLASS TUMBLER
Made by Baron Stiegel, at
Mannheim, Pa., in the 18th
century



Courtesy, C. Dorflinger & Sons.
AMERICAN GLASS, CUT
AND ENGRAVED



Courtesy, C. Dorflinger & Sons.
AMERICAN CUT GLASS



Courtesy, C. Dorflinger & Sons.
ENGRAVED AMERICAN GLASS

*See China of Our Forefathers, Mentor No. 86.

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and bring back images of the aristocratic homes that survived the Revolution.

Glass in the Making

Before sand is melted for the making of glass it is first cleansed of impurities. If a fine quality of glass is to be obtained, the sand is purified by washing, burning and sifting. In this way it is rid of iron, lime, chalk, magnesia and dirt that would affect its quality. When the sand is cleaned, "the batch" is made by skilfully mixing the ingredients of glass in their proper proportion. The mixture is then poured into melting pots of carefully selected clay, or into gas-heated "tank furnaces."

Molten glass is so sticky that it will adhere in a soft mass to the end of a stick, "and if the stick be a tube, the lump may be distended, by blowing through the tube, into a hollow sphere. The form of this sphere or bulb may be modified by manipulating the pipe, and if a second iron be attached by a seal of glass to the other side of the bulb, it may be drawn out into a tube. If the bulb be opened by removing it from the blowing iron, and then, after attaching it at its opposite side to another iron, be trundled rapidly like a mop, the opening will expand by centrifugal force, into a disk. These are the processes which, infinitely diversified and complicated by the skill of the workmen



Press Illustrating Service.

LUMPS OF CULLET, OR RAW GLASS



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MIXING THE BASE OF SAND, SODA AND LIME

Broken bottles are fused with the sand and alkalis to obtain a clear glass



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GLASS-BLOWING

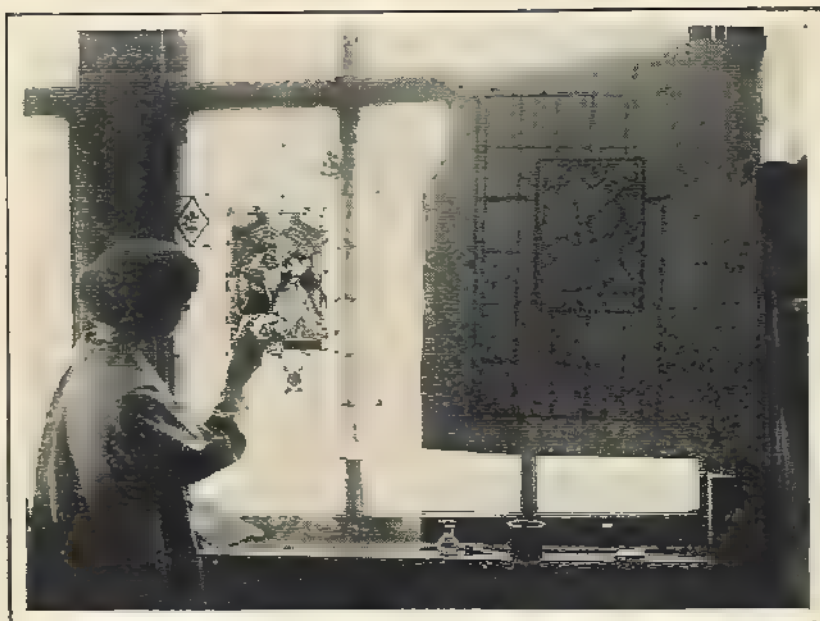
GLASS AND GLASS-MAKING



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AT WORK ON A CUT GLASS PITCHER

ovens are employed in which the substance remains for days subjected to a graduated temperature. This process is called annealing. Two types of annealing kilns or ovens are used—the intermittent and the continuous. The first is heated and filled with glassware, then sealed up and cooled by regulated drafts of air. The kiln most in use at the present time is the continuous oven, which is in the form of a long passage with a fire at one end. An endless chain carrying pans that contain glass objects passes slowly from the heated end of the oven to the cold end. In this way, the temperature affecting the ware is lowered little by little, and the pores of the glass contract evenly. To increase the toughness of glass it is sometimes immersed while hot in a vat of oil.



Press Illustrating Service

MAKING A STAINED GLASS WINDOW

SUPPLEMENTARY READING

GLASS MANUFACTURE *By Walter Rosenhain*

THE STORY OF GLASS *By Sara Ware Bassett*

Written for Young People.

THE GLASSWARE DEPARTMENT

By Mary A. Lehmann

GLASS AND GLASS MANUFACTURE

By P. Marson

DECORATIVE GLASS PROCESSES

By A. L. Duthie

ENGLISH TABLE GLASS

By P. Bate

* * Information concerning the above books may be had on application to the Editor of The Mentor.

T H E O P E N L E T T E R

The story of glass is about 6,000 years old. According to the Roman historian, Pliny (lived 23 A. D.—79 A. D.), some Phoenician merchants with a cargo of natron (carbonate of soda) landed on the coast of Palestine, near the mouth of the Belus, built their fire, and, finding no stones on which to place their cooking pot, took some of the pieces of natron for this purpose. When the natron was fused by the heat, it mixed with the sand and produced streams of a transparent, unknown fluid. Experts tell us that the production of glass in the open air in this way is impossible, but Pliny's legend is, nevertheless, frequently cited to account for the origin of glass.

Earlier records, however, go to show that the Egyptians antedated the Phoenicians in the use of glass. The oldest specimens of glass that we know are Egyptian, and it is quite probable that the land of the Pharaohs, was the original home of glass. The glass of early Egypt was usually opaque and made in colors, in small pieces for purposes of adornment, or in the form of vases, tiny vessels, or ornamental figures. Many of these delicate glass articles, iridescent in color, have been found in tombs 4,000 years old. To the sunlight of the present day the surfaces of these delicate little vessels throw back glints of light blue, yellow, black, red and green—opalescent color-echoes from centuries ago. The iridescence of ancient glass that has been exhumed was produced by the action of the earth moisture of ages—a process of decomposition of the glass by which tiny scales formed on its surface. This iridescence is produced artificially today by placing plain glass in an oven and introducing certain acids, the fumes of which deposit on the surface of the glass and produce a permanent opalescent effect.

The ancient Egyptians not only knew how to make glass, but how to make exquisite art glass pieces. They also used glass to imitate precious stones. So we see that, from its earliest years, glass has led a double life—one of great usefulness and beauty, and one of glittering pretense. Like many other things, animate and inanimate, glass was too beautiful to be altogether sincere—it so often looked “like the real thing” that the temptation to play the part of a gem was too strong to resist.

Transparent glass is about 2,500 years old, the oldest examples that we find being bottles. The value of transparency in glass had the effect of extending its use quickly and widely—for bowls, bottles, windows and for mirrors. Just when the art of blowing glass originated we know not; but blown-glass objects found by Dr. Petrie, when the city of Tel-el-Amarna in Upper Egypt (built by Amenhotep IV about 1400 B. C.), was excavated, give us one authentic date. The industry probably goes back several thousand years before the Christian era.

★ ★ ★

The peculiar consistency of glass adapts it for a wider use than almost any other material. Glass when cold is hard like crystal. When it is heated it is a liquid and it may be either poured into molds, blown or pressed into forms, or spun into threads and woven. Woven glass has the pliability and soft sheen of satin.

★ ★ ★

One of the most useful attributes of glass is its reflection. Backed by mercury or some other substance, glass has for ages “held the mirror up to nature.” When Louis XIV was building that great monument of luxury, Versailles, his minister, Colbert, imported in 1665 eighteen expert glass-makers from Venice—a city famous for glass-making art—and established them in France. There they made the great glass pieces for the “Hall of Mirrors.” Each of the great countries of Europe developed glass according to its own taste; and, today, we find glass in many of the affairs of life. We are so surrounded by glass that we may almost say that we live in glass houses. There are nearly one hundred kinds of glass, differing distinctly in characteristics. Glass is ever present in the useful and in the fine arts. It is supreme in optical science, where it gives various grades of service, from the ordinary eye-glass to the giant telescopic lens that surveys the heavenly stars. In fine arts it plays many parts—from the tiny bead used in simple decoration, to the superb stained-glass window that forms the crowning beauty of architectural monuments. The art of stained glass is a big subject, and we shall devote a special Mentor to it later on.

W. S. Moffat
EDITOR





EVERYONE has heard of the Portland, or Barberini, Vase, and many have seen it in the Gem Room of the British Museum in London. It is a cinerary urn, found in the seventeenth century in a tomb about three miles from Rome on the Frascati Road. The tomb was inscribed; likewise the sarcophagus in which this

vase containing ashes was found. The urn was taken to the library of the Barberini family, where it remained for over a century, until this library was purchased in 1782 by Sir William Hamilton.

When Sir William brought his treasure to London two years later, the Duchess of Portland begged him to sell it to her. This he did; but so secretly that no one knew that she owned it until six months after her death. At the sale of Her Grace's valuable collection in 1787, her son, the Duke of Portland, bought the precious vase for a thousand guineas (about \$5,200).

The catalogue described it as "the identical urn which contained the ashes of the Roman Emperor, Alexander Severus, and his mother, Mammaea, deposited in the earth about the year 235 after Christ, and dug up by order of Pope Barberini, named Urban VIII, between the years 1623 and 1644."

Old travelers who saw the vase in Rome thought it was made of natural stone,—sardonix, agate, etc. Count Caylus called it glass,—and glass it is, of a deep, pellucid blue adorned with exquisite cameo figures in semi-opaque glass laid on the blue surface.

The story goes that Josiah Wedgwood, the celebrated potter, was a bidder, and withdrew at the request of the Duke of Portland, who promised to lend him the priceless vase to copy. At any rate, Wedgwood had it for a year to study; and he produced about fifty "Portland Vases," which sold for forty guineas apiece. They are worth a great deal more now and are prized by collectors. These copies were finished with great care. The body was of blue-black "Jasper Ware," which Wedgwood had discovered, and the figures and bas-reliefs were of the same soft, delicate white as the originals, and were polished on the lapidary's wheel. Another reproduction was made by John Northwood of Stourbridge, England, the modern discoverer of the art of cameo-cutting on glass. Northwood worked on this model from 1874 to 1877, assisted by Philip Pargeter, a noted glass-manufacturer. In 1810, the Duke of Portland placed the original vase in the British Museum, where it remained on exhibition without acquiring any history until 1845, when a young madman threw a stone into the case and smashed the vase into fragments. However, it was so skilfully repaired that no trace of the damage is now perceptible.

The Portland Vase is not large, measuring only a little over nine inches high

and twenty-one inches in circumference.

Historians and critics have held many theories regarding the subject of the decorations. Some people say they depict the birth and death of Alexander Severus; others suppose they represent Pluto and Proserpine; and others, the nuptials of Thetis and Peleus.

Perhaps the most plausible theory (and the one that Wedgwood believed, after years of study,) is the following, worked out by an antiquary whose name is not known. He said: "The figures on the celebrated vase are of the most exquisite workmanship in bas-relief of white opaque glass raised on a ground of deep blue glass, which appears black except when held against the light. Mr. Wedgwood is of opinion that the figures have been made by cutting away the external crust of white opaque glass in the manner by which the finest cameos have been produced; and that it must, therefore, have been the labor of a great many years. Some antiquarians have placed the time of its production many centuries before the Christian Era, as sculpture was declining in the time of Alexander.

"Many opinions and conjectures have been published concerning the figures on the celebrated vase. Mr. Wedgwood has well observed that it does not seem probable that the Portland (Barberini) Vase was purposely made for the ashes of any particular person deceased, because many years must have been necessary for the production; hence, it may be concluded that the subject of its embellishment is not private history, but of a general nature. This subject appears to me to be well chosen and the story finely told, and represents what in ancient times engaged the attention of philosophers, poets and heroes. I mean a part of the Eleusinian Mysteries.

"These Mysteries were invented in Egypt and afterwards transferred to Greece, and flourished more particularly at Athens, which, at the same time, was the seat of the Fine Arts. They consisted of scenical exhibitions representing and inculcating the expectation of a future life, and on this account were encouraged by the Government. What subject could have been imagined so sublime for the ornaments of a funeral urn as the mortality of all things and their resuscitation? Where could the designer be supplied with emblems for the purpose before the Christian Era but from the Eleusinian Mysteries?"



THE LUCK OF EDEN HALL



THICK colored overlays of fused matter upon glass were known to ancient nations. Glass decorated with gold and enamel was made by the Egyptians. The Romans and Byzantine Greeks often decorated glass with thin washes of opaque paints; but they did not apply fusible lead enamels to glass. This discovery belongs to the

Persians and Arabians; and the art was brought to perfection in Damascus and Aleppo, where Persian workmen were numerous.

The Arabs carried on this industry for three centuries. It practically ended when Tamerlane invaded Syria and sent the glass-workers to Samarkand with all the other craftsmen. In the meantime, Crusaders had made the ware known in Europe. There was a great demand for it in Venice, so the Venetians copied it until they began to make their own characteristic ware, which completely changed taste and fashion.

The material of this old Oriental glass is exceedingly thick and tough, and because of the imperfect "fining," or clarification, and the innumerable, though minute, air bubbles, it is less easily shattered than any other kind of glass.

In color it varies from bottle green to amber and (rarely) to grayish white. The enamels are a fusible flux containing much lead, colored by various metallic oxides—the red by oxide of iron; the green by oxide of copper; and the yellow by antimonious acid. The blue, which is the dominant color in the decoration and the main characteristic, is not, as was once supposed, carbonate of lead colored with cobalt, or copper, but lazulite stone pounded with powdered glass. It appears in a variety of tints,—deep blue, turquoise and grayish blue.

The lamps (perhaps better described as lampshades, for the separate lamp is placed inside) have a swelling bulb body, a flaring neck and large ear-shaped handles. Bottles, jugs and flasks are round, or flattened, some with a high foot stand, others with a simple foot rim. Some have long slender necks. The flattened vessels are known as "pilgrim bottles." Little perfume bottles for rose-water and other scents are usually of this flattened shape. There are also bladder-shaped flower vases, dishes, bowls, beakers and goblets. The latter are often called "cups." Charlemagne's cup, a present from Haroun-al-Rashid, is now in the Museum of Chartres, France.

This kind of glass was of no artistic value until it came into the hands of the

decorator. First he applied the gold; then the pattern was drawn in thin red lines; and, finally, the colored enamels were laid on in thick masses. Regarding the motives of decorations, figure-subjects are absent in mosque lamps, but they occur in bottles, goblets and dishes.

Designs of polo-players; huntsmen mounted on horses and holding falcons on their wrists; people feasting; musicians playing instruments; flying birds; fishes with big heads and long fins, and handsome flowers and leaves are treated with spirit and fine decorative effect.

On the lamps there are often bands of tall cubic letters. The flowers are chiefly of the lotus or lily tribe, variously treated. Medallions often occur, containing emblems, or inscriptions, and, sometimes, the name of the decorator.

In the color combinations the innermost spot is always the clearest; and when the leaves or petals are red or blue, this spot is white; when the leaves are green this spot is yellow. Blackish-brown also appears in some specimens.

The burning in of the enamels seems to have been done in a single operation. Saracenic glass is very valuable. In 1887, a collector paid £1,600 (\$8,000) for a small goblet; but now-a-days, specimens bring even more fabulous sums.

The "Luck of Eden Hall," illustrated in gravure, is a drinking-cup long preserved at Eden Hall, in Cumberland, England. Presumably of Venetian workmanship, after the Saracenic style, this chalice of enameled glass was made in the tenth century. Its special fame rests on the legend of the Musgrave family that their fortunes depend upon its preservation.

The story goes that one night when the butler went for water to St. Cuthbert's well, he surprised a company of fairies dancing. When he seized their cup, the queen of the fairies exclaimed:

*"If e'er this cup should break or fall,
Farewell the luck of Eden Hall."*

The ballad was written several hundred years after some crusading ancestor brought the relic home; but it is a tribute to the beauty of the cup that a fairy origin was invented to account for it.





VENETIAN glass-making was highly developed in the thirteenth century. The Venetians made beautiful articles in the "style of Damascus"—in other words, the enameled ware of the Saracens—besides other kinds. So profitable was the industry that in 1275 laws were made prohibiting the exportation of sand and

other substances used in making glass, and also the fragments of broken glass. Severe regulations in Venice caused the glass-workers to move in a body to the neighboring island of Murano in 1690. From that date onward Venetian glass became famous. It was not only eagerly bought throughout Europe, but found its way as far as China.

At the end of the fifteenth and at the beginning of the sixteenth centuries, when the classical designs of the Renaissance influenced every industry, Murano craftsmen gave up all Gothic forms and decorations, and also the Oriental shapes and ornamentation for vases and cups, to follow the styles of ancient Greece and Rome.

The artists of Murano (they were more than artisans) studied all the specimens they could find, and analyzed fragments of old broken pieces; and, finally, they succeeded in reproducing everything that ancient Rome had made. To this period belong all those delicate wine glasses and glasses of the *luzza* form (like modern champagne glasses), standing-bowls, bottles and "fantasies," whose elegant forms and airy lightness bring delight to all that have a true feeling for beauty.

Venetian, or Murano, glass, falls into several groups:

(1) *Vessels of colorless and transparent glass, or glass of a single color*, that is to say, glass colored with metallic oxides before being worked into shapes. Drinking glasses of clear white glass are often decorated with colored glass laid on in threads externally, or forming part of the ornaments attached to the stems.

(2) *Gilt and enameled glass*. This form of decoration is used on both colored and colorless glass. In the sixteenth century, when massive forms gave place to lighter and more elegant ones, drinking glasses became too thin to bear the heat of the enameling furnace without losing their shape; so enameling was gradually superseded by painting in oil colors under the surface.

(3) *Crackled Glass*. The frosted, or crackled, glass dates from the sixteenth century. To produce it, the glass-blower plunged the hot bubble at the end of his tube into cold water before working it into the desired shape; or he rolled the hot bulb on powdered glass, which adhered to it, and then re-heated his bulb and worked it into the form desired.

(4) *Latticinio, Lattimo or Lattisvol*, the milk-white opaque glass, produced by the

introduction of oxide of tin, also dates from the sixteenth century. This was also used to form threads for decoration.

(5) *Vetro di trina*, lace or filigree glass, one of the loveliest of all Murano products, was inspired by ancient Roman models; but it surpasses in beauty and finish all fragments that have come down to us. This glass looks like candy, and is made most ingeniously by the arrangement of canes, or sticks, of glass and air-bubbles, that are reheated and shaped, reheated and shaped, again and again. Many varieties contain fine threads of glass, colored, or milk-white (*latticinio*), crossed and twisted in very intricate patterns. An extraordinary amount of dexterity was required to produce articles so minute and delicate, and yet so exact and regular.

(6) *Millefiori* (thousand flowers), or "star-work," is a mosaic glass, made of glass lozenges cut from the ends of colored filigree canes and arranged in regular patterns encased in transparent glass. Paper weights are still made of this material, which has a kaleidoscopic appearance. When the mass is reheated, any shape can be formed by the glass-blower.

(7) *Variegated, or marble opaque*, is called by the Venetians *calcedonio*, the opalescence being contributed, it is supposed, by phosphate of lime, or bone ash. The most common variety is a mixture of green and purple, which appears red by transmitted light. The pale blue appears orange, or yellow. This glass is made to imitate chalcedony (whence its name), jasper, *lapis lazuli* and tortoise shell. *Aventurine*, which belongs in this group, was very difficult to make. Its color is a transparent yellow, into which are fused little particles of copper to imitate "gold stone."

(8) *Splashed glass* was decorated with splashes of enamel scattered over the hot bulb bubble, which was re-heated and shaped.

(9) *Painted Glass* was made in the seventeenth and eighteenth centuries, the decorations being landscapes, classical figures, cupids, et cetera.

(10) *Engraved Glass*. The thinness of Venetian glass made it unsuitable for engraving; but occasionally Venetians drew delicate designs on their glass with a diamond. In the eighteenth century, when they had to compete with the new Bohemian glass, the Venetians tried deep engraving. Cutting with the wheel they also tried when there was a demand for "cut glass" of the English style.



GOBLETS OF BOHEMIAN GLASS

BOHEMIAN Glass is really a German glass. The Czechs, established in Bohemia as early as the fifth century, contributed no racial character to Bohemian glass. Their product became important about the end of the seventeenth century, although the industry was much more ancient. Many names of places in Bohemia

and Silesia—such as Glägersdorf and Glatz—show the extent of the industry. Glass-works were established in the Bohemian and Silesian forests as early as the fifteenth century; but these early works had little or no influence upon what the world calls "Bohemian Glass."

An attempt was made to imitate the natural product of rock-crystal, a substance that was cut into facets and ornamented by engraving. Rudolph II, the emperor, called some famous engravers of rock-crystal from Milan to Prague late in the sixteenth century, and started an establishment to make cut glass in imitation of rock-crystal, with great success.

It was not long before this new Bohemian glass competed successfully with the Venetian and, finally, drove it out of fashion. The real creator of this glass was Lehmann, a German, who was called to Prague by the emperor in 1590, and who, being an engraver on metals and gems, developed the new style of glass-cutting and engraving. His successor, Schwanhard, came from Nuremberg. The glass they made in Prague was white, cut in facets and engraved in the style of rock-crystal.

Deriving their style from the rock-crystal cut into shell-shaped vases, the engravers decorated them with florid designs. The Bohemian and Silesian tall cups with covers were exactly suited to the taste of the day. Nothing finer of their kind was ever produced than the covered cups, trefoil, quatrefoil or octagonal in form, or the fluted goblets with ruby and leaf gold in their cut, or twisted, stems and in the knobs of their covers. These were what drove out old Murano and took the lead in the general change of taste.

In 1670, Johann Kunckel, a Silesian chemist, working for the Elector of Brandenburg in Prussia, discovered the famous "ruby glass." The fine color was said to have been produced by the use of gold instead of copper. This was highly valued in its day, and had doubtless much influence in causing the Bohemian glass-makers to go back to the colored glass that they had made before the Prague house began to imitate rock-crystal.

The Bohemians followed the business of making colored glass with such ardor that colored and engraved glass is to many of us the type of "Bohemian Glass."

Many old American families possess decanters and toilet-bottles of this glass, and treasure them for their peculiar charm.

Little wonder that examples of this craft found their way across the seas; for by the end of the eighteenth century Bohemia had eighty glass-houses and 5,000 glass-makers! "Bohemian glass," says Sauzay, "owes its merited renown to the talent of the artists and industrious people of Bohemia. Their factories have known at all periods how to meet the caprices of fashion; and they always gave to their productions a very marked decorative character. We are charmed not so much by the great pieces *de luxe* of very studied form and fine, delicate and skilful engraving, as by the simple goblets used by the people. Notwithstanding their imperfections, we like such decorations as show on a background of ruby, or topaz, a classic deer bounding through a pine forest, although the engraving is summary and broad and the method and style belong to the Middle Ages."

The manager of a French glass-house, visiting Bohemia in 1861, wrote: "The country exports nearly all of its ware to the richer provinces of Austria, to all Germany, and to Switzerland, Italy, the East, Russia and America. These numerous establishments in the middle of the forests produce ordinary glassware; objects destined to be highly worked, or richly engraved; and colored glasses, which are decorated with gilding and paintings."

"Bohemian glass is pure, white, and light. It has not the brilliancy of French crystal, and it is liable to turn yellow with time. Bohemia has preserved its shapes, which entirely differ from ours, and which are appreciated by certain purchasers to such a degree that we are sometimes obliged to imitate them. Fancy articles and the colored glasses of Bohemia have an originality which is not always in accordance with good taste, but which is valued and sought after because of its strangeness. Bohemia has given birth to a kind of prophet which agrees more with the German than with the French taste. The productions of Bohemia are less finished in detail than ours. The mouths of bottles and other similar objects are made with a carelessness that would not be tolerated in France."



ENGLISH CUT GLASS BOWL OF THE 18TH CENTURY

GLASS AND GLASS-MAKING

English Glass of the Eighteenth Century

FIVE



AN important change in the making of glass was introduced in England late in the seventeenth century. This consisted of using large quantities of lead with a proportion of potash as a base. The glass thus made is known in England as Flint Glass and in France as *Cristal*. But it must be remembered that eighteenth-century

"crystal" had nothing to do with the *cristallo* of Venice, which was a *soda glass*.

The use of lead in glass-making was not precisely a discovery; for clear glass of the Roman period has occasionally been met with, and ancient opaque red glass contains lead. The glass of the Middle Ages called "Jewish Glass" also had lead in its composition; but these do not seem to have contained potash.

Monsieur Peligot, a noted authority, came to the conclusion that "to the English should be attributed the honor of having created in their *flint glass* a new product, which, by the progress made in the quality and selection of the materials used in its fabrication, has become, without dispute, the most beautiful glassy substance that we know."

The famous English flint glass was made by mixing three parts of pure sand, well washed and burned, with two parts of red lead and one part of carbonate of potash (usually pearl ash imported from Canada or Russia).

A small portion of saltpeter and a little oxide of manganese were subsequently added to cleanse the "metal." In fusing this glass, great importance was attached to the quick melting of the materials and to the subsequent rapid working of the pot.

This glass became very important in the days of William and Mary. The great merit of lead glass lies in its absolute transparency and brilliancy, combined with a certain darkness in the shadows. It has one quality that distinguishes it from all other kinds of glass—the power of dispersing the rays of white light.

The elements of which their light is composed are bent aside in different degrees, as they pass through lead glass, so that the issuing ray is broken up into its component colors. This is what gives the *fire* that is fully brought out when the surface is cut up into facets and angles. Lead glass, or flint glass, in its *dispersive power* thus stands apart from other glass and rivals the flashing diamond in scattering component parts of light.

Though English flint glass began to be popular in 1670, it was not until a hundred years later that there was a rage for faceted glass. Everything then bristled with sharp points, pyramids and tiny peaks that exhibited the fire and sparkle of the glass.

English "cut" reached perfection in 1780. It went all over Europe, and was

imported in immense quantities to America. It completely superseded the Bohemian Glass, as the Bohemian had superseded the Murano.

Glass decorated in the Bohemian and Dutch styles with engraving now held a subordinate position to the famous "cut glass," and so did the beautiful opaque glass decorated with enamel colors, that was made in Bristol about this time.

Drinking glasses are, perhaps, the most typical forms. Their bowls are straight-sided, waisted or bell-shaped. The design often has a rose on one side and a butterfly on the other. Bunches of grapes and leaves (and a humming-bird sometimes added) were used for wine-glasses; ears of barley were used for beer glasses.

Towards the middle of the century glass, like pottery, was decorated with political and popular mottoes, designs, portraits and emblems. Stems were "drawn," i.e., formed of the same piece of "metal" as the bowl; or they were made separately and applied to the shank. The drawn stem is often marked by spiral lines in relief, "rib-twisted," cut into flat facets, or with spiral lines within the cylinder. These lines are formed of strings of opaque white, or, more rarely, of colored glass; or, again, they are made by empty threads formed by drawing out a bubble of air. These are called "opaque twisted stems." The air-drawn stem was brought to perfection in England.

"We must seek the origin of this device," writes an authority, "in the large 'blows,' often of very irregular shape, that fill the knob, or bulb, in the stems of earlier glasses. This 'blow' is sometimes prolonged into a sort of tail, which passes down nearly to the foot. In other cases we find several smaller 'tears' in the same bulb formed, it appears, by puncturing, while it is still soft, the little mass of glass destined to form the bulb, and then covering it with a second gathering. It may be mentioned, in a general way, that a loose, widely-spaced spiral is characteristic of the earlier glasses, while the tightly twisted stems are only found in late examples.

"This applies also to the spirals on the rib-twisted stems of plain glass. There is another point that should not be overlooked. This is that the twist on the eighteenth-century glass always descends from right to left, while on modern imitations the reverse direction is generally taken."



IT was a Dutchman, Jan Smeedes, that gave the glass-making industry its first impetus on the Island of Manhattan. Glassmakers' Street, now South William Street, New York, was so named because of the importance of his shop. Pittsburgh had its birth as a glass-making center at the end of the eighteenth century. A

carpenter living in Sandwich, Massachusetts, enriched the industry by inventing pressed glass in the year 1827. Most of the enterprises launched before the middle of the nineteenth century were concerned with the production of bottles and plain tableware. Little was done toward the development of decorative glassware until 1840. Bottles were the first objects to attract the attention of the designer. Colored bright blue, green or red, they now appeared in the shape of log cabins and barrels. Old cupboards and museums still treasure dishes that bear the American flag and the national bird, and handles and household articles made of old-time opal or cloudy glass.

The first sizeable factory for the making of flint and colored glass, the New England Glass Works, was established near Boston. Later, the Libby Glass Company was founded at Toledo, Ohio. This concern is now one of the largest in the country and produces many different kinds of glass objects, varying from the strictly utilitarian to the highly decorative. The plant organized in 1852 by Christopher Dorflinger in Brooklyn, New York, began by making glass for lamps and chimneys, to meet a demand arising from the discovery of petroleum. The modest lamp factory became the parent of the widely known Dorflinger cut glass works, now at White Mills, Pennsylvania. In 1864, a firm operating glass-houses in Wheeling, West Virginia, brought about a revolution in processes of manufacture by making a clear, brilliant glass with the aid of bicarbonate of soda and lime, and at one-third the cost of the lead glass, also called flint glass.

The United States leads all countries in the production of pressed and cut glass. The best grade of the latter is entirely hand-cut; the second grade is pressed and then finished by hand; the third grade is pressed in imitation of cut glass.

"Genuine cut glass," says Mary Lehmann, author of an instructive little manual about glass and its manufacture, "has four characteristics known to the expert. These are: Its color—a brilliant white, tinged with steely blue; its bell-like resonance when struck; its weight; its fine finish." Genuine cut glass has the design cut in and is polished by hand. All good glass contains a certain amount of lead,

and this gives to the object a ringing tone when it is lightly tapped.

In making a cut-glass dish, the thick "blank" is first brought to a very high temperature and gradually cooled before the design is traced. Steel and stone wheels in varying sizes are employed in the exacting labor of cutting. "Glass cutters," Miss Lehmann reminds us, "must be expert workmen, for their material is heavy and yet easily broken, and mistakes can seldom be corrected. The operator must hold the blank against the wheel with just the right amount of pressure for the speed of the wheel; the vibration of the glass will cause it to crack, unless skilfully handled. The operator judges the proper pressure by feeling, as much as by sight. Elaborate pieces require several weeks for cutting and polishing, and the labor cost is very heavy."

The cutting of rock-crystal (a white, transparent form of quartz or crystallized silica) is a separate art, and resembles engraving. Another kind of cut glass is made by incising shallow designs with stone wheels and copper tools. Stone-engraved goblets sometimes cost as high as forty dollars apiece.

Preeminent in the manufacture of fine cut glass, America has also produced a remarkable colored glass, known as Tiffany favrile (hand-made) glass. Mr. Louis C. Tiffany, who established his furnaces at Corona, Long Island, in 1892, is still the guiding spirit of this very exceptional art industry. He secures his rare color effects by introducing metallic oxides—gold, copper, iron, et cetera—into the raw glass. Or ladlefuls of molten colored glass, taken from several different pots, are mixed together with beautiful "accidental" results. In Tiffany ware, the color effects most in favor are peacock, gold luster, opal-tinted, purplish blue, turquoise, and aqua marine blue with bronze or pale green lights.

This tough, metallic, glowing, jewel-like glass from the Tiffany furnaces is used not only in the making of exquisitely shaped vases and tableware, but lends itself to the creation of windows, memorial tablets, and mosaic mural decoration. A glass curtain, completed within recent years for the National Theater in Mexico City, stands as a supreme achievement of Mr. Tiffany's genius. Twenty craftsmen in mosaic glass were employed in its construction for more than fifteen months.

A TEACHER SPEAKS



LAST fall I obtained a position as teacher of intermediate subjects in a large private school. I accepted with fear and trembling, as it was five years since I had graduated from high school, and I had little experience in teaching to build on.

That first day at school, I shall never forget. I was asked to talk to a class of twenty-five girls on Russia. I was totally at a loss as we had no text-books, so I worried through the period by talking about war conditions in Russia. At noon I went home discouraged, feeling that I could never "carry on."

Suddenly I thought of "THE MENTOR" on "The Story of Russia" that I had seen at a friend's home. I borrowed it, and, on the following morning, was able to give my class an intelligent talk that won their interest immediately. In accomplishing this I was greatly aided by the six beautiful gravure pictures.

At once I realized what "THE MENTOR" would mean to me in my school work; so sent in my subscription for a year. With my first number came a complete list of "THE MENTOR" subjects, and then I decided that I could not afford to miss a single issue. As my salary is small, it has been a drain on me to pay back the money I was obliged to borrow with which to buy all the back issues. However, I have acquired a library of knowledge in a concise and convenient form, that would cost hundreds of dollars to duplicate in book form. The total cost has been about \$30.00, and it is the best investment I ever made.

Every day I use "THE MENTOR" in connection with my History, Geography, English and Reading Courses. I have several of the gravure pictures hung on the walls of my class-room, but change them frequently, to coincide with the subject matter of the daily work.

The children like "THE MENTOR" quite as much as I do, and have bought many numbers on subjects that were of particular interest to them. Several of the girls have subscribed to your magazine, and together we have formed a "MENTOR CLUB" in my class. As a result, I devote one period to it, every other week, on the day following our receipt of the magazine. We then read and discuss the subject of that issue and it is a veritable recreation and most instructive. The variety of subjects that "THE MENTOR" covers opens up many new interests for the children.

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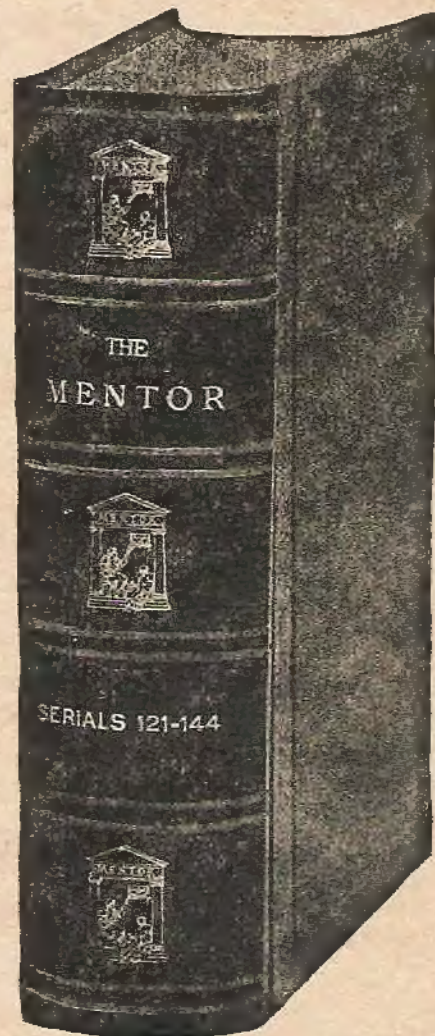
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